MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

PDS0101 – INTRODUCTION TO DIGITAL SYSTEMS

(All sections / Groups)

17 NOV 2015
2.30 PM – 4.30 PM
(2 HOURS)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 11 pages including cover page with **5** Questions only.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please **print all your answers in the Question Paper itself** in the space provided.

QUESTION 1

(a) Convert Octal Number 37621 to the following number systems.

(i) Decimal

(ii) Binary

(iii) Hexadecimal

[3 marks]

(b) Perform the following arithmetic operations. [3 marks]

(i) $1367_8 + 715_8$

(ii) $B15F_{16} - A7_{16}$

Continued ...

(c) The state of a 8-bit register is $0001\ 0111_2$. Find the following,

(i) Unsigned decimal number [2 marks]

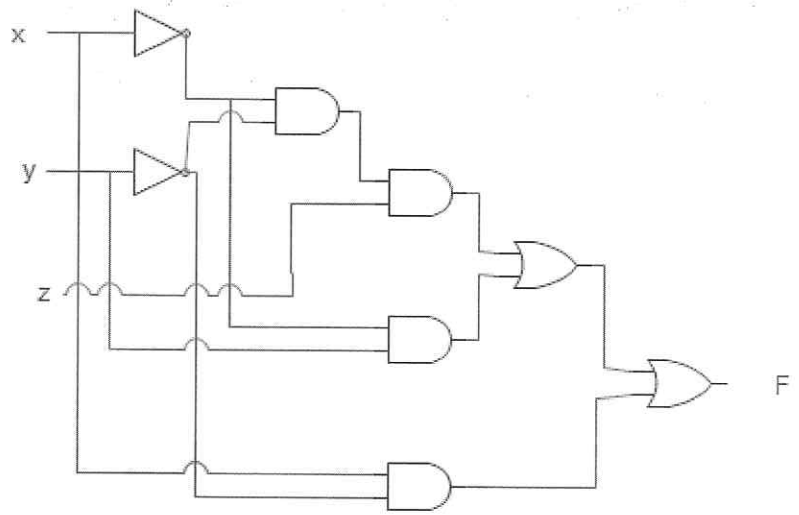
(ii) Signed -1's-complement representation [1 mark]

(iii) Signed - 2's-complement representation [1 mark]

Continued ...

QUESTION 2

(a) Based on the figure given below,



(i) Determine the Boolean expression for the output F as a function of three inputs, x, y, and z.

(ii) Simplify the generated Boolean expression, F in Question 2 (i) using Boolean algebra and express it as function $F_{simplified}$.

(iii) Write Boolean expression, $F_{simplified}$ in Product of Sums (POS).

[2+2+2 marks]

(i)

Continued ...

(ii)

(iii)

Continued ...

(b) Draw a 4-bit parallel binary adder logic circuit using only full adder. [4 marks]

QUESTION 3

(a) Design a 4-bit serial in – parallel out shift register using D flip-flop. [3 marks]

Continued ...

(b) Given the clock frequency of 2 KHz, calculate the following

i) Period

ii) Duty Cycle if the pulse width is 1 ms

[2+2 marks]

(c) Prove that 2-input NOR gate is equivalent to 2-input negative-AND using truth table.

[3 marks]

Continued ...

QUESTION 4

(a) Given the truth table as shown below, whereby a, b, and c are the inputs and y is the output. Perform the following tasks

a	b	c	y
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

(i) Derive Sum-of-Product (SOP) expression from above truth table; express it as F(y).

(ii) Simplify F(y) using Karnaugh Map, express it as $F(y)_{simplified}$.

(iii) Draw the logic diagram of $F(y)_{simplified}$.

(iv) Prove that F(y) and $F(y)_{simplified}$ are equivalent using truth table.

[2+3+3+2 marks]

(i)

Continued ...

(ii)

(iii)

Continued ...

(iv)

QUESTION 5

(a) What is the difference between an asynchronous and synchronous sequential counter? [3 marks]

Continued ...

(b) Draw a sequential logic circuit diagram of a 3-bit asynchronous up counter using positive going transition JK flip flop. [3 marks]

(c) Draw a sequential logic circuit diagram of a 3-bit synchronous up counter using positive going transition JK flip flop. [4 marks]

End of Paper